

# MEC 155 Mechanisms

## COURSE OUTLINE

**Prerequisites:** Basic knowledge of algebra

### Course Description:

Studies the purpose and actions of cams, gear trains, levers, and other mechanical devices used to transmit control. Focuses on motions, linkages, velocities, and acceleration of points within a link mechanism; layout method for designing cams and gear grain. Requires preparation of weekly laboratory reports.

This course is the second in a series of four courses which prepare students for certification as a Siemens Certified Mechatronic Systems Assistant. The job profile for which the Level 1 certification prepares students is that of a machine operator, who has a well-rounded understanding of the complex inter-relationships and inter-workings of a mechatronic system.

This course, as all courses within the Certification Program, is based upon a systems-oriented approach. Students learn about individual components and system characteristics within the context of an actual mechatronic system. At the beginning of this course, students should first be presented with a complex system. Ideally, this system is physically available at the educational institution and within the first class meetings should be visited by the students. By focusing on an actual system, students understand clearly why they are learning the subject material. This increases significantly the learning effect and promotes a fuller understanding of the material being learned. By viewing the system as a whole, learning retention is also increased, as the student experiences the components as part of a whole, rather than in isolation. Of great importance is that the student is able to transfer the knowledge learned to a new system and is able to quickly familiarize himself in a new context.

This understanding leads to a better informed employee who has sufficient knowledge to make well-informed decisions about the running of the system upon which he or she is working.

**Semester Credits:** 2 hrs **Lecture Hours:** 1 Hours **Lab/Recitation Hours:** 2 Hours

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## Course Outcomes:

**At the completion of this course, the student should be able to:**

1. Explain the role of various mechanical components within a given system or module.
2. Trace and describe the flow of energy in a given mechatronic system or subsystem.
3. Describe the basic physical properties of mechanical components including materials, lubrication requirements and surface properties.
4. Carry out adjustments on mechanical components in a mechatronic system.
5. Read, analyze and utilize the technical data sheets for the mechanical components and electrical drives within a mechatronic system.
6. Correctly localize, identify and document causes of malfunctions in mechanical components or electrical drives, based upon the technical documentation.
7. Correct malfunctions where possible, or correctly identify the expertise required to correct a malfunction.
8. Apply safety rules while working on the system.
9. Transfer the knowledge learned from one system to another system.

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## Required Materials:

1. Tooling University, online subscription, purchased through Tooling U bookstore(online) to receive student discount.
- 2.

## Textbook (optional)\*:

The following supplementary materials are available:

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## Topical Description:

Content to be covered within this course includes the following topics:

- . Mechanical Components
  - 3.1. Pins and Keys
    - 3.1.1. Fundamentals
  - 3.2. Chain Drives
    - 3.2.1. Fundamentals
    - 3.2.2. Types and Applications
    - 3.2.3. Using and Maintaining
  - 3.3. Gears
    - 3.3.1. Fundamentals
    - 3.3.2. Gear Types
    - 3.3.3. Using and Maintaining
  - 3.4. Rolling Contact Bearing
    - 3.4.1. Fundamentals
    - 3.4.2. Bearing Types
    - 3.4.3. Using and Maintaining
  - 3.5. Power Transmission Shafts
    - 3.5.1. Fundamentals
    - 3.5.2. Radial Locating Devices
    - 3.5.3. Axial Locating Devices
    - 3.5.4. Flywheels
    - 3.5.5. Using and Maintaining
  - 3.6. Shaft Couplings
    - 3.6.1. Fundamentals
    - 3.6.2. Shaft Coupling Types
    - 3.6.3. Using and Maintaining
  - 3.7. Clutches
    - 3.7.1. Fundamentals
    - 3.7.2. Clutch Types
    - 3.7.3. Using and Maintaining
  - 3.8. Belt Drives
    - 3.8.1. Fundamentals
    - 3.8.2. Belt Drive Types
    - 3.8.3. Using and Maintaining
  - 3.9. Journal Bearings
    - 3.9.1. Fundamentals

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- 3.9.2. Types and Lubrication
- 3.10. Mechanical Springs
  - 3.10.1. Types
  - 3.10.2. Compression Springs
- 3.11. Threads and Screws
  - 3.11.1. Fundamentals
  - 3.11.2. Types

## Course Materials

Recommended basic course materials are in digital form:

Course materials provided by SMSCP Partner Schools to their students are at the partner school's discretion, and may include special software such as SIMIT, Diagnostic Kit software, etc. If desired, a supporting textbook on basic PLC topics may be required by the school or instructor. Students must also have access to a mechatronic training system containing all or most of the basic component types covered in the course. Please see the SMSCP "Hardware Requirements" document for more information on system requirements for Level 1 instruction.

# Introduction to Mechatronics

## Notes to Instructors

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1. Fluid CIM, a software package for simulation, is required

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